REMARKS

Applicants submit these remarks in response to the Office Action dated September 25, 2006 ("Office Action"). This Response is filed on the three-month deadline of December 26, 2006 (December 25 being a holiday). Therefore, Applicants believe that this response is being timely filed. However, in the event that Applicants are incorrect in their assumption, please charge any necessary fee to Deposit Account No. 23-2415, referencing Attorney Docket No. 34569-701.201.

Applicants submit the above amendments to expedite allowance of the subject application. It is believed that the amendments should raise no significant new issues. Accordingly, Applicants respectfully request that the amendments be entered.

Paragraph [00074] on page 16 of Applicants' Specification has been revised to remove allegedly objectionable hyperlink.

Claims 1-17 are pending in the application. Independent Claim 1 was revised to further point out substep (a1) of "quantifying an average effect," clarifying step (d) to recite "inferring said network relationship" and adding step (d1) to recite "mapping said network relationship." These revisions are supported throughout the specification:

In the Office Action, Claims 1-17 were rejected under 35 U.S.C. §101 as allegedly being drawn to non statutory subject matter. Claims 1-17 were also rejected under 35 U.S.C. §101 for alleged lack of utility. Claims 1-17 were further rejected under 35 U.S.C. §112, first paragraph for alleged lack of utility. These rejections are traversed for at least the following reasons.

The Law

Mathematical algorithms are not patentable subject matter only to the extent that they are merely abstract ideas since, standing alone, certain types of mathematical subject matter "represent nothing

more than abstract ideas until reduced to some type of practical application, i.e., 'a useful, concrete and tangible result.'" *State Street Bank & Trust v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998) (citing *In re Alappat*, 33 F.3d 1526 (Fed. Cir. 1994)). "Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not 'useful.' From a practical standpoint, this means that to be patentable an algorithm must be applied in a 'useful' way" and "[t]he mere fact that a claimed invention involves inputting numbers, calculating numbers, outputting numbers, and storing numbers, in and of itself, [does] not render it nonstatutory subject matter." *Id.* at 1373-74.

In holding that a patent's claims to a method for enhancing a long distance telephone call message record by adding a data field with information on the long distance provider of the call recipient fell "comfortably within the broad scope of patentable subject matter," the Federal Circuit noted that "[b]ecause § 101 includes processes as a category of patentable subject matter, the judicially defined proscription against patenting of a 'mathematical algorithm,' to the extent such a proscription still exists, is narrowly limited to mathematical algorithms in the abstract." *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352 (Fed. Cir. 1999).

In *State Street*, the Federal Circuit explained that "the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces 'a useful, concrete and tangible result' – a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades." *Id.* For comparative purposes, Applicants note that the independent claim at issue in *State Street* reads:

A data processing system for managing a financial services configuration of a portfolio established as a partnership, each partner being one of a plurality of funds, comprising:

(a)   computer processor means for processing data;

(b)   storage means for storing data on a storage medium;

(c)   first means for initializing the storage medium;

(d)   second means for processing data regarding assets in the portfolio and each of the funds from a previous day and data regarding increases or decreases in each of the funds, assets and for allocating the percentage share that each fund holds in the portfolio;

(e)   third means for processing data regarding daily incremental income, expenses, and net realized gain or loss for the portfolio and for allocating such data among each fund;

(f)   fourth means for processing data regarding daily net unrealized gain or loss for the portfolio and for allocating such data among each fund; and

(g)   fifth means for processing data regarding aggregate year-end income, expenses, and capital gain or loss for the portfolio and each of the funds.

Applicants respectfully point out that no "output" step resulting in a physical transformation outside the computer was recited in the issued claims.

The law makes it clear that "[o]nly when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under 35 U.S.C. § 101." M.P.E.P. § 2106(II)(A). "To be statutory, a claimed computer-related process must either: (A) result in a physical transformation outside the computer for which a practical application in the technological arts is either disclosed in the specification or would have been known to a skilled artisan, or (B) be limited to a practical application within the technological arts." M.P.E.P. § 2106(IV)(B)(2)(b). The M.P.E.P at § 2106(IV)(B)(2)(b)(ii) also illustrates why the claims such as those pending are drawn to statutory subject matter:

A computer process that simply calculates a mathematical algorithm that models noise is nonstatutory. However, a claimed process for digitally filtering noise employing the mathematical algorithm is statutory.

Claim 1

Independent claim 1 of the instant application reads:

A method for inferring a network relationship between genes, comprising:

(a) providing a quantitative time course data library for a set of genes of an organism, said library including expression results based on time course of expression of each gene in said set of genes,
(a1) quantifying an average effect and measure of variability of each time point on each other of said genes;

(b) creating a sparse matrix from said library, said matrix having zero coefficients removed therefrom;

(c) generating a set of linear differential equations from said matrix;

(d) solving said set of equations thereby inferring said network relationship; and
(d1) mapping said network relationship.

As apparent from reading Applicants' Specification, the presently claimed method has at least one practical application within the technological arts. Therefore, analogous to the claims at issue in *State Street* and consistent with the example from the M.P.E.P. set forth above, independent claim 1 is proper under 35 U.S.C. § 101.

For example, in paragraphs [00046] and [0047] Applicants' Specification discloses the utility and advantages of the present invention:

"[0046] We have described and demonstrated methods to infer a gene regulatory network in the form of a linear system of differential equations from measured gene expression data. Due to the limited number of time points at which measurements are typically made, finding a gene regulatory

network is usually an underdetermined problem. Since biologically the resulting gene regulatory network is expected to be sparse, we set some of the matrix entries equal to zero, and infer a network using only the nonzero entries. The number of nonzero entries, and thus the sparseness of the network, was determined from the data using Akaike's Information Criterion without using any ad hoc parameters.

[0047] Describing a gene network in terms of differential equations has at least three advantages. First, the set of differential equations describes causal relations between genes: a coefficient Λ_{ij} of the coefficient matrix determines the effect of gene j on gene i. Second, it describes gene interactions in an explicitly numerical form. Third, because of the large amount of information present in a system of differential equations, other network forms can easily be derived from it. In addition, we can link the inferred network to other analysis or visualization tools, such as Genomic Object Net (see Ref. 22)."

Paragraph [00048] of Applicants' Specification further discusses advantages of the present invention compared to conventional methods of inferring gene networks:

"[0048] In previously described methods, either loops cannot be found (such as in Bayesian network models) or the methods artificially generate loops in the network. While the method described here allows loops to be present in the network, their existence is not required. Loops are found only if warranted by the data. For example, when inferring a regulatory network between gene clusters using time-course data of Bacillus subtilis in an MMGE medium, we found that some of the clusters were part of a loop, while others were not (see Examples below and FIG. 2)."

Paragraph [0061] further provides:

"The methods for determining network relationships between genes and the new statistical methods can be used in research, the biomedical sciences, including diagnostics, for developing new diagnoses and for selection of lead compounds in the pharmaceutical industry."

For example, mapping gene relationships inferred according to the presently claimed methods allows for the rational design of therapeutics not only based on a gene's function but also the effect of the gene on other genes in the identified networks which in turn improves the action of the therapeutic.

For at least the reasons set forth above, Applicants believe that pending claims 1-17 are directed to statutory subject matter. Accordingly, withdrawal of the rejections under sections 101 and 112 first paragraph is respectfully requested.

Claims 1-17 were further rejected under 35 U.S.C. §112, first paragraph, for alleged lack of enabling description. This rejection is traversed for at least the following reasons.

The detailed description provides ample guidance for implementing the claimed method. Moreover, the specification provides Examples which clearly illustrate how to carry out the claimed method in order to infer a gene network based on quantitative gene expression data.

Accordingly, the rejection is improper and withdrawal thereof is respectfully requested.

Claims 1-17 were further rejected under 35 U.S.C. §112, second paragraph, for alleged being indefinite. This rejection is traversed for at least the following reasons.

In order to expedite allowance of the subject application, Applicants have amended the claims as indicated above.

The Office Action queries as to the meaning of quantitative time course data library for a set of genes and other references to the basic gene expression data incorporated in the methods of the present invention. The type of data employed in conjunction with the claimed invention is illustrated in paragraph [0007] of the present Specification:

"[0007] In time-ordered gene expression measurements, the temporal pattern of gene expression can be investigated by measuring the gene expression levels at a small number of points in time.

Periodically varying gene expression levels have, for instance, been measured during the cell cycle of the yeast Saccharomyces cerevisiae (see Ref. 1). Gene responses to a slowly changing environment have been measured during a diauxic shift of the same yeast (see Ref. 2). Other experiments measured temporal gene expression patterns in response to an abrupt change in the environment of the organism. As an example, the gene expression response was measured of the cyanobacterium Synechocystis sp. PCC 6803 after to sudden shift in the intensity of external light (see Refs. 3 and 4)."

The Office Action also queries as to the definition of the term "sparse matrix." The Specification provides ample description of this phrase. Likewise, one of skill in the art will have no difficulty understanding the meets and bounds of the type of effects a gene j would have on a gene i as contemplated by the claimed method.

Regarding step (b) creating a sparse matrix from said library, said matrix having zero coefficients removed therefrom, Applicants respectfully submit that this language is clear and definite. One of skill in the art will have difficulty in appreciating that removing zero coefficients is part of creating sparse matrix from a library containing gene expression data.

Claim 1 has been objected to for allegedly omitting certain essential steps. It is believed that revised Claim 1 is free of this objection.

The Office Action queries as to the meaning of the term "medium" recited in claim 17. It is respectfully submitted that those skilled in the art will understand the term "medium" to refer to a data storage item.

Claims 1-17 were rejected under 35 U.S.C 102(b) as allegedly anticipated by Chen [Pacific Symposium on Biocomputing, 1999, p. 29-40]. This rejection is traversed in as much as it is applied to the present claims.

A reference is only good for what it clearly and definitely discloses. As noted by the Federal Circuit, anticipation under 35 U.S.C. § 102 occurs only "when the same device or method, having all of the elements contained in the claim limitations, is described in a single prior art reference." *Crown Operations International, Ltd. v. Solutia, Inc.*, 289 F.3d 1367 (Fed. Cir. 2002). "A single prior art reference anticipates a patent claim if it expressly or inherently describes each and every limitation set forth in the patent claim." *Trintec Industries, Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292 (Fed. Cir. 2002). Moreover, the "single reference must describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in the prior art." *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116 (Fed. Cir. 2002). *See also In re Spada*, 911 F.2d. 705, 708 (Fed. Cir. 1990) (stating that "the reference must describe the applicant's claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it."); *PPG Indus., Inc. v. Guardian Indus., Corp.*, 75 F.3d 1558 (Fed. Cir. 1996) ("To anticipate a claim, a reference must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter.").

Chen does not disclose each feature of the present claims. For example, as acknowledged in the Office Action, Chen does not suggest creating a sparse matrix from a library, with the matrix having zero coefficients removed therefrom. The Office Action however ignores this limitation for alleged indefiniteness. As discussed above, step (b) creating a sparse matrix from said library, said matrix having zero coefficients removed therefrom is clear and definite. Removal of zero coefficients is clearly part of the step of creating the sparse matrix. Accordingly, withdrawal of the 102 rejection based on Chen is respectfully requested.
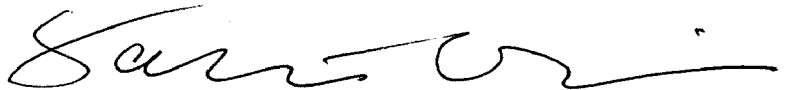
CONCLUSION

In view of the above amendments and remarks, it is believed that claims 1-17 now under consideration in the application are in condition for allowance and such favorable action is earnestly solicited. This Response is filed on the three-month deadline of December 26, 2006 (December 25 being a holiday). Therefore, Applicants believe that this response is being timely filed. However, in the event that Applicants are incorrect in their assumption, please charge any necessary fee to Deposit Account No. 23-2415, referencing Attorney Docket No. 34569-701.201.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (858) 350-2337.

Respectfully submitted,

WILSON SONSINI GOODRICH & ROSATI
Professional Corporation

Dated: December 26, 2006   Samir Elamrani, Ph.D., Agent for Applicant
                                            Registration No. 43,601